Scottish & Southern Electricity Networks

# RIIO ED2 Engineering Justification Paper (EJP)

## *Gutcher Primary Substations*

## *Worst Served Customer Proposal*

*Investment Reference No: 382_SHEPD_REGIONAL_WSC_GUTCHER*

# Contents

# Definitions and Abbreviations

| Acronym | Definition |
|---|---|
| EJP | Engineering Justification Paper |
| CBA | Cost Benefit Analysis |
| IDP | Investment Decision Pack |
| WSC | Worst Served Customer |
| NoSR | North of Scotland Resilience |
| SSEN | Scottish and Southern Electricity Network |
| NRN | Network Reference Number |
| EHV | Extra High Voltage (33kV) |
| CBRM | Condition Based Risk Management |
| MDG | Mobile Diesel Generator |

## 1 Executive Summary

This Engineering Justification Paper (EJP) covers the strategic investment required to address the high volume of interruptions on the Gutcher network, specifically that which serves the Isle of Fetlar, Shetland. Gutcher primary supplies 234 customers of which 77 are WSCs and all of these 77 WSCs are located on the Isle of Fetlar. Customers on the Isle of Fetlar have experienced up to 23 interruptions over the three consecutive years between 2017 and 2019 with average interruption length of around four and half hours.

Following optioneering and detailed analysis, as set out in this EJP, the proposed scope of works to address the WSC issue at Isle of Fetlar are as follows:

- Build new approximately 10km of 11kV covered conductor OHL circuit from the start of the 11kV network on the Isle of Fetlar and across the whole island;
- Augment approx. 3.5km of existing 11kV OHL on the Isle of Fetlar to 3 phase operation.

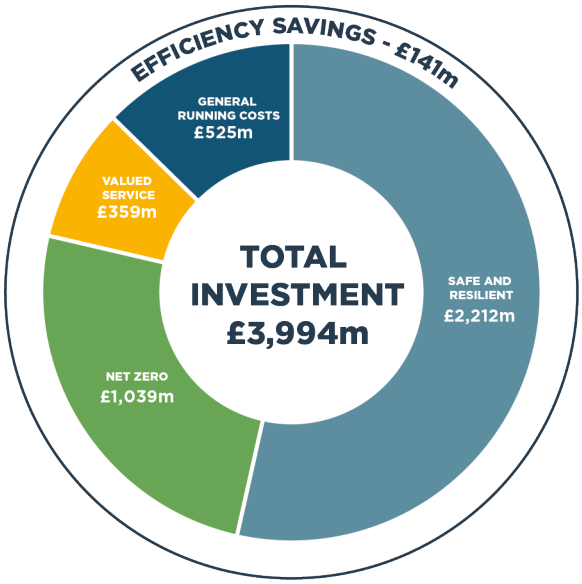
Delivering a safe, resilient and responsive network

The anticipated cost to deliver the proposed solution is £0.71m. The Isle of Fetlar is a very remote area of Scotland and on average access to this area can take prolonged lengths of time, due to the requirement for two ferry crossings, which results in longer fault interruption lengths. Due to this, the area has a higher network investment priority score, indicating higher vulnerability. The scheme is therefore prioritised for delivery in the third year in ED2 with the refinement phase commencing in the first year in ED2.

The scheme delivers following outputs and benefits:

- Improved network performance for the 77 WSCs at Isle of Fetlar by installing a new 11kV OHL to split the existing 11kV network; this is expected to take all 77 WSC out of this classification;
- Improved CI/CML performance as a result of the works with expected volume reductions of 168 CIs and 46354 CMLs in the SHEPD area per year;
- Improves the fault resilience of the Isle of Fetlar when 11kV faults do occur by providing potential remote control fault resilience options on the island.

This Non-Load investment sits within the Safe and Resilient Totex.



## 2 Investment Summary Table

Table 1 below provides a high level summary of the key information relevant to this Engineering Justification Paper (EJP).

*Table 1: Investment Summary*

| | | | | | | |
|---|---|---|---|---|---|---|
| Name of Scheme/Programme | Gutcher Substation WSC Proposal | | | | | |
| Primary Investment Driver | North of Scotland Resilience | | | | | |
| Scheme reference/mechanism or category | 382_SHEPD_REGIONAL_WSC_GUTCHER | | | | | |
| Output reference/type | As above | | | | | |
| Cost | Cost for the selected Investment is £0.71m | | | | | |
| Delivery year | 2024/25 | | | | | |
| Reporting Table | CV15 North of Scotland Resilience (SHEPD) | | | | | |
| Outputs included in RIIO ED1 Business Plan | **No** | | | | | |
| Spend Apportionment (£m) | **2023** | **2024** | **2025** | **2026** | **2027** | **Total** |
| | 0 | 0 | 0.71 | 0 | 0 | **0.71** |

## 3 Introduction

This EJP provides high-level background information for this proposed WSC scheme explaining the data and analysis undertaken, the existing network arrangement, the proposed works and improvements to the network, the expected outcomes from these works and justifications for the proposals with the Paper.

In order to establish the most economic and efficient solution, the EJP provides an exhaustive list of the options considered through the optioneering process. This is based on the background information and fault data analysis detailed in section 4. Each option is described in detail in section 6, with the justification set out for those options which are deemed unviable solutions, and therefore not taken forward to the Option Analysis in section 7.

The Primary Investment Driver described within this EJP is CV15 – North of Scotland Resilience and the proposed investment will improve the Isle of Fetlar 11kV network. Post improvement works, due to lower numbers of faults impacting the Isle of Fetlar customers, all customers will be removed from WSC classification. Gutcher and specifically the Isle of Fetlar customer has consistently featured in the WSC list ED1. In year 2019, 77 customers out of total 243 customers at Gutcher are in the WSC category which represents all of the customers on the Isle of Fetlar. These customers experienced high volumes of interruptions, with interruptions of up to 23 over the 3-year period. This clearly is not acceptable to both our customers and ourselves.

# 4 Background Information and Analysis

## 4.1 Existing Network

Gutcher is a settlement on the northeast coast of Yell in the Shetland Islands. It is supplied from Gremista 33kV substation via a long 33kV overhead line network. This network is broken down to following elements with the supplying substations at the end of each element:

*Table 2: Gutcher 33kV Supply*

| Circuit | Site | 33kV Circuit Length | Total customer at the site | WSC at the site in 2019 |
|---|---|---|---|---|
| Gremista - Voe | Voe (687) (Shetland mainland) | 24.4km | 1507 | 14 |
| Voe-Brae | Brae (699) (Shetland mainland) | 8.6km | 996 | 109 |
| Brae – Firth | Firth (692) (Shetland mainland) | 10.9km | 395 | 0 |
| Firth – Mid Yell | Mid Yell (698) (Yell Island) | 20km | 436 | 0 |
| Mid Yell – Gutcher | Gutcher (695) (Yell Island) | 13.2km | 234 | 77 |
| Gutcher – Unst | Unst (791) (Unst Island) | 20.3km | 562 | 319 |

Gutcher primary has only one 11kV circuit, that is interconnected with Unst 11kV network via 11kV subsea cable and the Yell 11kV network through a recently installed circuit interconnection. However, this recently installed circuit interconnection will not generate the required network performance improvement to significantly benefit the Fetlar customers. Gutcher Primary supplies the Fetlar island via a 11kV subsea cable of approximately 3.3km length which is part of a long 11kV radial section of network. The radial network on the Isle of Fetlar stretches approximately 13km to supply all of the customers on the island. In the event of a fault, it takes much longer than average to restore this part of the network due to ferry crossings being required.

The overall Gutcher 11kV feeder detail are summarised in the table below.

*Table 3: Gutcher WSCs 11kV Circuit*

| **11kV Circuit** | **Number of connected customers** | **Number of PSR customers** | **Length of OHL (km)** | **Length of UG cable (km)** |
|---|---|---|---|---|
| **695-011** | 234 | 46 | 47.57 | 6.60 |

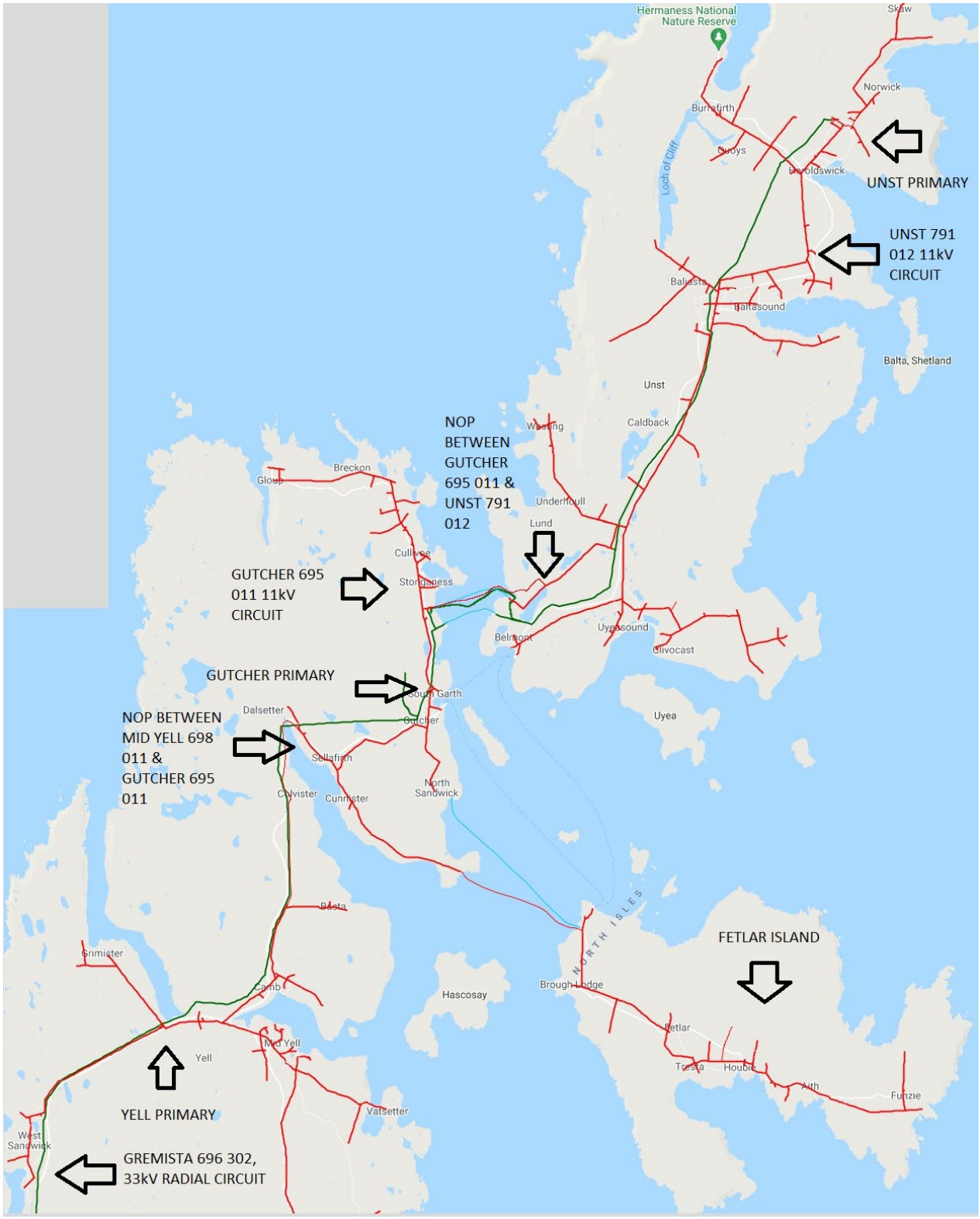



*Figure 1: The existing 33kV and 11kV networks Yell, Unst and North Isles of Shetland.*

### 4.2 WSC Network Performance

The 77 WSCs represents all of the customers on the Isle of Fetlar. This group of customers have consistently featured on the WSC list over the ED1 years. They experienced up to 23 interruptions over the 3-year period with average interruption length of 271 minutes.

The average interruption length for this circuit is significantly higher than the average SHEPD circuit. This is due to the remoteness of the site, the lack of interconnection and the requirement to obtain two ferries to reach the Isle of Fetlar from the Shetland mainland. There are no retained ex SSEN staff located on the Isle of Fetlar as, at present, there are no alternative circuit arrangements to allow switching operations to get customers back on supply during a fault. Personnel, vehicles or equipment required to respond to a damage fault are dispatched from Lerwick depot which requires two ferries to reach the Isle of Fetlar.

The table below shows the WSC network performance on the 11kV circuit basis (although this also counts 33kV interruptions which impacted the respective 11kV circuit as well). It shows the WSC number and the range of interruptions over the 3-year period from the reporting year 2019/20 against each circuit. As part of the feedback from the stakeholder engagement event, the interruption duration and the customer vulnerability are also considered as key factors in scheme proposal. These are also shown in the table.

*Table 4: WSC Network Performance*

| **11kV Circuit** | **WSC No.** | **Range of interruption No. over 3-year** | **Average interruption length (mins)** | **Network Investment Priority score (high score = more vulnerable)** |
|---|---|---|---|---|
| **695-011** | 77 | 13-23 | 271 | 4.1 |

### 4.3 Fault Data Analysis

The list below reflects where faults have affected higher customer numbers across the proposed area for investment, there are other lower customer number faults that have occurred during the identified WSC time period which have not been listed.

*Table 5: Fault History*

| Date | Fault Description | No. Customers Impacted |
|---|---|---|
| 2017 | 11kV fault: Deterioration, Faulty PMT | 76 |
| 2017 | 11kV fault: Transient, PMCB Operation (poor comms leading to delay in reclose and PMCB on Fetlar island) | 76 |
| 2017 | 11kV fault: Deterioration, broken OHL insulator | 129 |
| 2017 | 11kV fault: Deterioration, broken OHL binder | 57 |
| 2018 | 11kV fault: Birds, Broken OHL Conductor | 130 |
| 2018 | 11kV fault: Birds, Broken OHL Conductor | 80 |
| 2018 | 11kV fault: Wind and Gale, Broken OHL Pole | 76 |
| 2019 | 11kV fault: Birds, Broken OHL Conductor | 131 |
| 2019 | 11kV fault: Lightning, Broken OHL Insulator on ABSD | 79 |
| 2019 | 11kV fault: Transient, PMCB Operation on SEF | 127 |

| | | |
|---|---|---|
| 2017 | 33kV fault: Deterioration, OHL insulator failure, (Customers affected includes wider Shetland customers) | 799 |
| 2017 | 33kV fault: CB failure at Firth Primary, (Customers affected includes wider Shetland customers) | 4107 |
| 2018 | 33kV fault: Transient, delay in restoration due to comms issues, (Customers affected includes wider Shetland customers) | 4142 |

The 33kV faults have not been the major contributory factor to the WSCs at Fetlar with three 33kV interruptions over the last 3-year period. Due to the remoteness of the Fetlar island 11kV network, there have been over 10 number of 11kV faults over the 3-year period and high interruption length due to ferry crossings being required. It is 11kV faults which have been the predominant factor in the WSC performance of this network during the 2017 and 2019 period.

As a result network arrangement of the Gutcher 695-011 11kV circuit and the 11kV spur section which supplies the Isle of Fetlar, a single 11kV fault which causes damage, can cause an outage for all the Fetlar customers and can only be recovered in the repair time for the fault. From fault analysis, it is seen that several 11kV faults happen on the Isle of Fetlar which are problematic to access and remedy. Therefore, the most beneficial improvement is likely to be enhancing the infrastructure on the island itself.

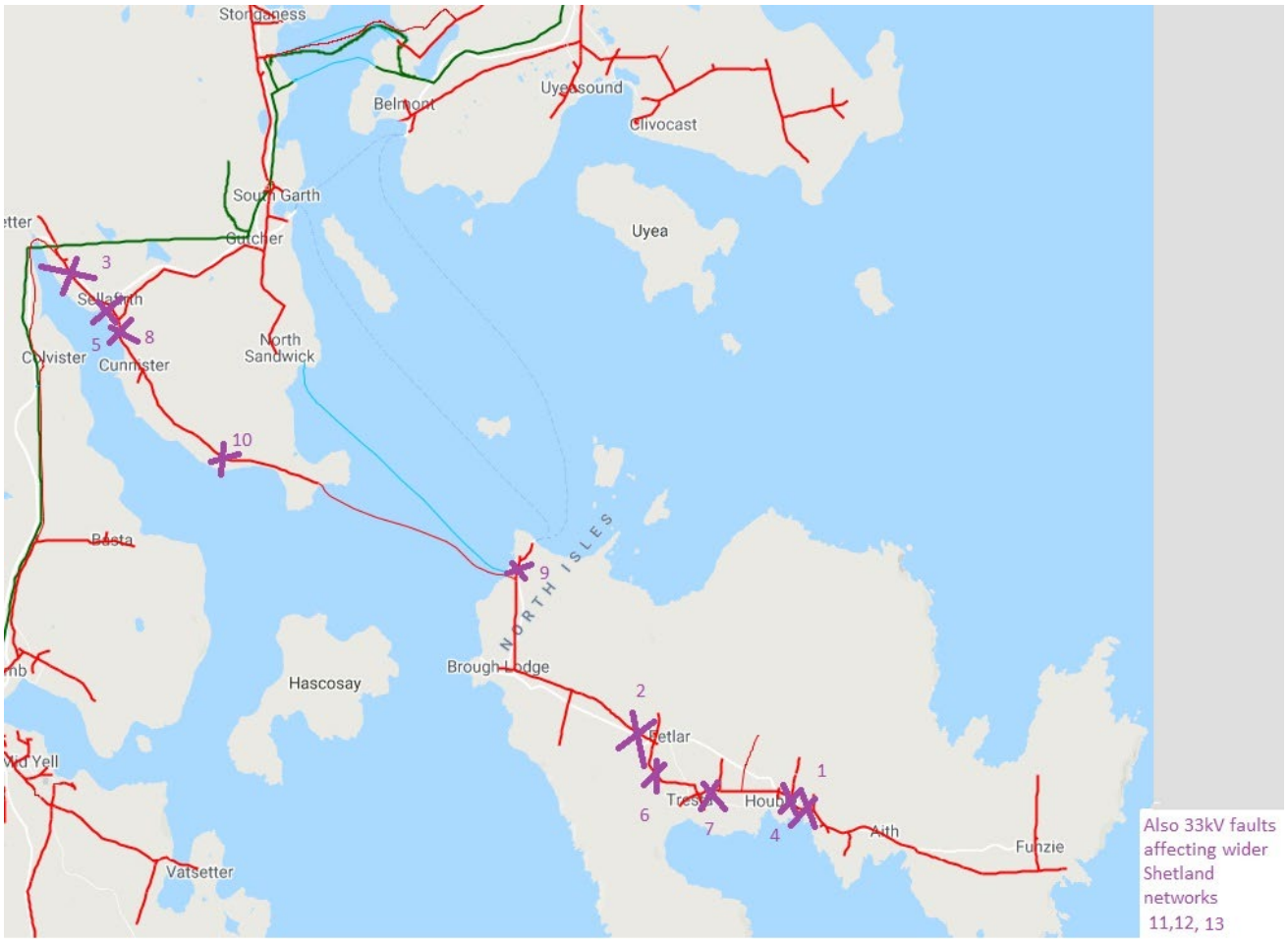



*Figure 2: Location of faults affecting Fetlar customers*

# 5 Optioneering

This section of the report sets out the investment options that are considered when resolving the WSC issues. As described below a holistic approach is taken to ensure investment options which are both least regrets and represents best value for money for network customers are identified.

## 5.1 Summary of Options

Table below provides a high-level summary of the 5 investment options under consideration along with the advantages and disadvantages associated with each. A more detailed description of each option is then provided within the proceeding sub-sections.

*Table 6: Summary of WSC Investment Options*

| Option | Description | Advantages | Disadvantages | Result |
|---|---|---|---|---|
| **1. Do Nothing (Baseline)** | No upfront action taken to improve the network performance.<br>Maintenance and Inspection activities continue as normal. | No additional cost | WSCs will continue experiencing high number of interruptions. | Rejected |
| **2. Enhanced Maintenance and/or Inspection (Refurbishment)** | Enhanced inspection and maintenance to improve asset condition or slow the rate of ageing. | Cost effective over short time period<br>No large upfront CAPEX | Additional maintenance resource required<br>Significant proportion of customers remain as WSCs<br>Increase in OPEX | Taken forward to further assessment. |
| **3. Re-build existing lines (Replacement)** | Rebuilding the existing network where the WSCs are to reduce the probability of failure on components. | Improve the network performance over short term<br>No further maintenance or inspection required | Increase in CAPEX<br>Lower utilisation of existing assets<br>WSCs will fall back in this category over short period of time.<br>No new fault resilience added | Taken forward to further assessment. |
| **4. Reinforcing existing network (Reinforcement)** | Installation of additional assets to mitigate the risk of interruptions due to single circuit supply arrangement | WSCs unlikely to return to this category as new fault resilience added<br>Long term investment<br>Wider benefits to network users including Net Zero targets | Often costly when compared with other options<br>Longer delivery time due to the likely requirement of additional consent | Taken forward to further assessment/preferred option. |
| **5. Flexible solutions** | Use battery storage or other alternative mean to support the network and mitigate interruptions | Reduced requirement of reinforcing the network | Technology and mechanism is yet to be proven<br>Limited sites that can utilise such | Option rejected. |

| | | | | |
|---|---|---|---|---|
| | | Competitive cost comparing to the reinforcement option | arrangement to improve WSC performance | |

# 6 Analysis and Cost

## 6.1 Option 1: Do Nothing

**Estimated Cost: £0k**

This group of customers at Fetlar are supplied by 11kV radial spur section which in a very remote area of Scotland. Without any intervention, the WSCs will experience similar or higher level of 11kV interruptions into ED2 and beyond. Therefore, this option is not considered viable.

## 6.2 Option 2: Enhanced Maintenance and/or Inspection (Refurbishment)

**Estimated Cost: £85k**

This option is to carry out enhanced maintenance on the Gutcher 695-011 11kV circuit. This will target the assets with poor health condition and the worst performing sections with targeted measures such as pole replacement and refurbishment. This is likely to improve the network performance for a small portion of the WSCs. However, given that are a number of faults are due to external factors, such as wind and gale, lightning, birds and transient events, then this option will not resolve these potential faults. It is likely that significant number of customers would remain as WSCs as no fault resilience is added to the circuit in the form of circuit interconnection or splitting the circuit and so the Fetlar section of the 11kV circuit would remain exposed to faults arising from external factors.

Due to the lack of significant network improvement, the Fetlar customers could experience WSC equivalent performance during the full ED2 period. Taking account of the anticipated post works deterioration in network performance, the likely outcome is that the Option 2 refurbishment in ED2 would have to be followed by the Option 4 reinforcement in ED3.

## 6.3 Option 3: Re-build existing lines (Replacement)

**Estimated Cost: £674k**

Under this option, it is considered that the worst performing sections of the network are re-built and this includes approximately [redacted] of the feeder on Fetlar Island.

As a result of the proposed works, it is expected that the network performance will result in reasonable improvements however the network performance would deteriorate over time. It is likely that significant number of customers would remain as WSCs as no fault resilience is added to the circuit in the form of circuit interconnection or splitting the circuit and so the Fetlar section of the 11kV circuit would remain exposed to faults arising from external factors.

During the proposed Option 3 works, it is likely that the proposals would be built as an ‘online’ build which requires circuit outages that would impact the respective WSC and potentially wider area customers. Also, it would lead to an increase in diesel usage and $CO_2$ emissions due to usage of mobile generation to ensure customers were not off supply for excessive periods of time during the works.

It is assumed that 20 years post carrying out the Option 3 works, due to deteriorating performance of the circuit, that the Option 4 reinforcement proposal would have to be implemented at that point in the future.

### 6.4 Option 4: Reinforcing existing network (Reinforcement)

**Estimated Cost: £713k**

To address the WSCs at Fetlar, it is proposed to 10km of covered conductor overhead line across the length of the island, from the point where the 11kV subsea cable lands to the other end of the island. Also included is augmenting of approx. 3.5km of existing OHL to 3 phase operation on the far end of the island. This would enable the 11kV circuit to be split this into 2 separate sections as part of normal network operation.

The proposed option will help reduce the number of individual 11kV faults on the Isle of Fetlar which impacts all customers across the island as it splits the network into 2 different 11kV sections, this will limit the impact of any 11kV fault in any one section. This therefore reduces the total number of faults experienced per year by the customers and also provides new options for backfeed arrangements, including possible remote-control recovery options. For potential 11kV faults that will occur on the Isle of Fetlar, it enhances the overall fault resilience of the island.

The recently installed 11kV circuit interconnection of the Gutcher and Yell circuits would only help to mitigate approximately 10 - 20% of future 11kV faults which would affect the Fetlar customers. Therefore, it has been determined that further enhancement works will be required to remove the customers from WSC classification.

During the proposed Option 4 works, as the proposal is to build new infrastructure, the majority of new equipment can be constructed as 'offline' build. This would minimise the requirement for circuit outages that would impact the respective WSC and potentially wider area customers. As there would be less requirement for outages, this would result in lower amounts of diesel usage and $CO_2$ emissions due to usage of mobile generation as compared to Option 3.

Therefore, taking account of these factors, this is the preferred option.

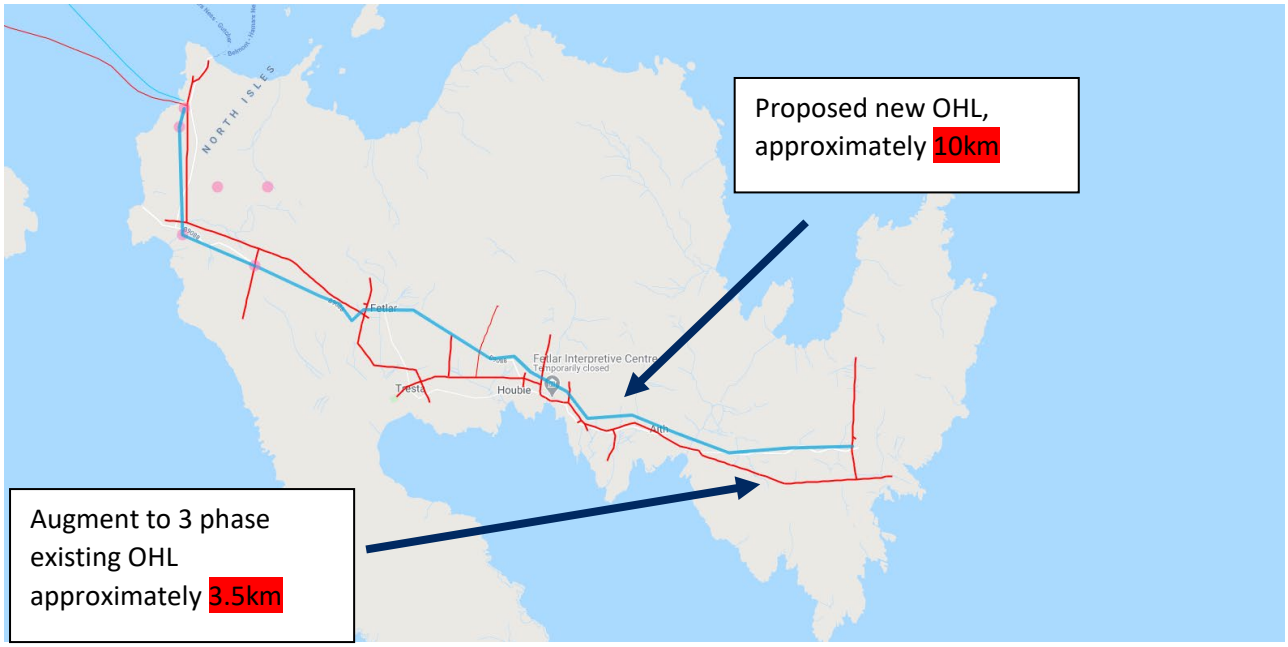



*Figure 3: Proposed Option 4 works at Fetlar*

### 6.5 Option 5: Flexible Solution

**Estimated Cost: £134k**

Flexibility services could be used to support some of the remote substations in the HV fault scenario. The flexible solution needs to be made available throughout the year and be able to support the network over the period to allow the restoration. This period can be up to 2 hours based on the fault history.

The estimated cost is based on the energy storage service to support 0.5MW load with maximum utilisation of 30 days per annum starting from year 2 in ED2. The details costing is attached in appendix 4. The technology is still unproven for a solution that can support the network of this size for this duration. Due to the nature of the HV faults and the network, there will also be the challenge in identifying the best location for this service in the network. Under this option, it is unlikely to improve the performance for all WSCs at Fetlar Island. Therefore, this option is not considered viable.

# 7 Option Analysis

This section of the report provides an overview of the CI/CML results and analysis for each option. It provides an overall comparative review and analysis of the options, confirmation of the EJP preferred option and the associated justifications. The figures presented below represent the expected percentage improvement of the Ofgem CI & CML methodology ratio figures for SHEPD area per year and the expected actual volume reductions of CI and CMLs in the SHEPD area per year.

## 7.1 CI/CML Analysis of refurbishing the existing line (Option 2)

It is expected that following Customer Interruption (CI) and Customer Minutes Lost (CML) improvements will be achieved under this option. These figures are too low to improve the number of WSC and will make no discernible impact on the quality of supply and network performance. The assumption is that these benefits will diminish over a period of five years, by when the reinforcement option would be necessary to address the WSC issue.

*Table 7: CI/CML Improvement for Option 2*

| | CI Improvement % (Actual Volume) | CML Improvement % (Actual volume) |
|---|---|---|
| Gutcher (695-011) | 0.001 (11) | 0.004 (3025) |

## 7.2 CI/CML Analysis of re-building of the existing line (Option 3)

It is expected that the CI & CML improvements for the re-build option would be higher than the refurbishment option but are remain low CI & CML values due to the same network arrangement being retained. The assumption is that these benefits will diminish over a period of twenty years and at this future point the reinforcement option would be necessary to address the WSC issue.

*Table 8: CI/CML Improvement for Option 3*

| | CI Improvement % (Actual Volume) | CML Improvement % (Actual volume) |
|---|---|---|
| Gutcher (695-011) | 0.004 (34) | 0.012 (9350) |

## 7.3 CI/CML Analysis of reinforcement of the network (Option 4)

The expected CI and CML improvements based on this option is as shown in the table below. The table shows a significant improvement for CI/CML and network performance relative to the customer numbers involved and this will remove all Fetlar customers from WSC classification.

*Table 9: CI/CML Improvement for Option 4*

| | CI Improvement % (Actual Volume) | CML Improvement % (Actual volume) |
|---|---|---|
| Gutcher (695-011) | 0.021 (168) | 0.0573 (46354) |

From the above tables, it is evident that the CI/CML improvement from the reinforcement option is significantly higher than the other proposed options. This confirms the case that Option 4 is the most preferable option as it delivers the required level of improvement to the network and will permanently remove those customers from WSC classification.

## 7.4 Summary of Cost

*Table 10: Summary of Cost*

| Options | Unit | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| **Option 1 – Do Minimum** | £m | 0 | 0 | 0 | 0 | 0 | 0 |
| **Option 2 – Enhanced Maintenance and Inspection** | £m | 0 | 0 | 0.09 | 0 | 0 | 0.09 |
| **Option 3 – Asset Replacement** | £m | 0 | 0 | 0.67 | 0 | 0 | 0.67 |
| **Option 4 – Reinforcement** | £m | 0 | 0 | 0.71 | 0 | 0 | 0.71 |
| **Option 5 – Flexible Solution** | £m | 0 | 0 | 0.045 | 0.045 | 0.045 | 0.13 |

Our RIIO ED2 Business Plan costs are derived from our outturn RIIO ED1 expenditure. We have modified costs per activity, capturing and reporting those adjustments in our cost-book. By tying our costs back to reported, outturn, real life data this approach provides multiple data points on which both the Regulator and we can benchmark cost efficiency.

It provides a high level of cost confidence in our Business Plan cost forecast for RIIO ED2. Through our benchmarking analysis, we recognised that not all Non-Load related RIIO-ED1 actual unit costs sit within the upper quartile efficiency band. Where this is the case, we have applied a catch-up efficiency to those cost categories.

Further detail on our unit cost approach, cost efficiency and cost confidence for RIIO-ED2 can be found within our ***Cost Efficiency (Annex 15.1)***. Following our draft Business Plan, we have continued to develop project volumes and costs, utilising valuable stakeholder feedback. We have included developments of our Commercial Strategy within the updated project scope and delivery strategy.

## 7.5 Option Analysis comparisons

As outlined in the EJP, due the remoteness of the Isle of Fetlar from the main island of Shetland, this significantly lengthens the fault interruption duration experienced by the customers because ferry crossings are required to reach the island. Therefore, any enhancements which can improve fault resilience on the Isle of Fetlar itself are of significant benefit.

The tables above demonstrate that the reinforcement option is the preferred option as the other options are either rejected as non-viable, have poorer CI/CML performance or higher investment cost. As Options 2 and 3 do not introduce any new fault resilience to the Isle of Fetlar; they only deliver marginal improvement in CI/CML and network performance; which will deteriorate in future years and therefore they cannot be chosen as the preferred option.

The preferred option allows the customers to benefit from investment in ED2 and improved CI/CML and network performance. Both Option 2 and Option 3 are envisaged to incorporate the works in Option 4 with reinforcement in the future years to achieve the improved performance delivered by Option 4.

As such, it is understood that delaying the investment does not provide the best value for money solution, reinforcing the case for Option 4.

## 7.6 Volume on Preferred Option

*Table 11: Volume of Preferred Option*

| Asset Category | Unit | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | Total |
|---|---|---|---|---|---|---|---|
| **11kV Poles** | # | 0 | 0 | 143 | 0 | 0 | 143 |
| **11kV OHL (Covered Conductor)** | Km | 0 | 0 | 10 | 0 | 0 | 10 |
| **11kV CB (PM)** | # | 0 | 0 | 2 | 0 | 0 | 2 |
| **11kV Switch (PM)** | # | 0 | 0 | 2 | 0 | 0 | 2 |
| **11kV Pole Refurbishment** | # | 0 | 0 | 66 | 0 | 0 | 66 |

## 8 Validate investment plans and benefits with Stakeholders

This section of the EJP describes the stakeholder engagement strategy that has been implemented to inform SSEN's RIIO-ED2 submissions. This includes the engagement activities that have been undertaken, the stakeholder groups that have been approached, and the feedback that has been gathered from this stakeholder engagement.

The intention of this exercise was to identify the appetite from our stakeholders for SSEN in carry out the investment described within this document during RIIO-ED2 to improve the condition of SSEN's network assets and the quality of supply for customers in during ED2 and beyond.

We conducted audience research with stakeholders via online workshops/open forums to co-create our strategies and priorities in RIIO-ED2 for improving the network for WSCs. Following insights were derived:

- Stakeholders suggested that, based on the remote location of some Scottish islands, investment for the WSCs there should be a priority, as it will potentially take far longer to restore power there compared to mainland areas.
- There was no consensus on whether investment in worst-served circuits should be prioritized according to: number of WSCs; number of interruptions; level of customer vulnerability; or potential of low carbon technology (LCT) take-up.
- Stakeholders, however, expressed concern about the impact of power cuts on customers in vulnerable situations, and on this basis focusing investment efforts on reducing the number of worst-served vulnerable customers was supported.
- The interruption duration which is currently not considered in Ofgem's WSC definition is recognized as an important factor by our stakeholders.
- Stakeholders suggested that an annual WSC report would be welcome and raise the profile of the issue but might give the incorrect impression that these are the areas where there will be investment.
- Some stakeholders were concerned about the impact of worst-served circuits on generation as well as supply customers.

The lack of consensus on stakeholders on how to prioritise worst-served areas for improvement clearly suggests that being worst-served is a substantial detriment to all such customers, albeit playing out in different ways and therefore remedying these is extremely important. Therefore, we are committing to remove at least 75% of customers from this list in ED2; this ambitious proportion represents all circuits where cost benefit analysis warrants investment; the remaining 25% of WSCs are distributed over so many circuits that the benefit derived from each circuit investment would be limited to very few customers.

We will also ensure that we communicate effectively during power outages, particularly for remote communities where electricity is heavily relied upon, promote the PSR and the 105 power outage number, and produce an annual WSC report to be shared with wider stakeholders to embed resilience partnerships.

Based on the stakeholder feedback, the average Customer Minutes Lost (CML), Priority Service Register (PSR) and the vulnerability score from the Customer Mapping Tool are also factored in the scheme consideration.

## 9 Deliverability and Risk

Between our draft and final Business Plans we have carried out a more detailed deliverability assessment of our overall plan as a package and its component investments. Using our draft Business Plan investment and phasing as a baseline we have followed our deliverability assessment methodology. We have assessed any potential delivery constraints to our plan based on:

- In-house workforce capacity and skills constraints based on our planned recruitment and training profile and planned sourcing mix as well as the efficiencies we have built into our Business Plan (detailed in our ***Ensuring Deliverability and a Resilient Workforce (Chapter 16)*** and ***Cost Efficiency (Chapter 15)***
- Assessment of the specific lead and delivery timelines for the asset classes in our planned schemes
- We have evaluated our sourcing mix where there were known delivery constraints to assess opportunities to alleviate any constraints through outsourcing
- We have engaged our supply chain (detailed in our ***Supply Chain (Annex 16.2)***) to explore how the supply chain could support us to efficiently deliver greater volumes of work and how we could implement a range of alternative contracting strategies to deliver this
- We have also engaged with the supply chain on the delivery of work volumes that sit within Uncertainty Mechanisms to ensure we have plans in place to deliver this work if and when the need arises
- We have assessed the synergies between our planned load, non-load, and environmental investments to most efficiently plan the scheduling of work and minimise disruption to consumers
- Based on our assessment of delivery constraints and potential solutions to resolve them, we have revised our investment phasing accordingly to ensure our Business Plan is deliverable, meets our consumers' needs and is most cost efficient for our consumers

Scottish National Heritage and Scottish Environment Protection Agency may object to OHL circuits or elements of them and request undergrounding of sections of the OHL proposed routes or impose various conditions related to archaeological or environmental or ecological requirements to carry out the works.

## 10 Conclusion

The purpose of this Engineering Justification Paper (EJP) has been to describe the overarching investment strategy that SSEN intends to take during RIIO ED2 for the NoSR related investment in the Gutcher network.

Five investment options have been described which could be carried out to address the WSC issue at these sites. As detailed within Section 7, a holistic approach is taken when selecting the most viable option for each investment, where the primary and secondary investment drivers are assessed together within the Option Analysis and Assessment section. This includes careful consideration of the financial, safety, and environmental implications of each investment option.

- Option 1: Do Minimum
- Option 2: Enhanced Maintenance and Inspections
- Option 3: Asset Replacement
- Option 4: Asset Reinforcement
- Option 5: Flexible Solution

A thorough stakeholder engagement exercise was undertaken to gather feedback on each of these strategies to determine which approach should be proposed within SSEN's RIIO ED2 business plans.

As a result, the following costs and volumes are proposed for delivery during RIIO ED2. The preferred investment for Gutcher substation in RIIO ED2 is Option 4: Reinforcement.

*Table 12: Summary of CV Table*

| CV Table | Unit | 2023 | 2024 | 2025 | 2026 | 2027 | Total |
|---|---|---|---|---|---|---|---|
| **CV15 North of Scotland Resilience RIIO ED2 Spend** | £m | 0 | 0 | 0.71 | 0 | 0 | 0.71 |

## 11 Appendix 1 List of Indicators of Vulnerable Characteristics and Weighting System

These indicators are applied when producing combined indexes of vulnerability.

| Indicator of vulnerable characteristic | Network investment priority: score (high score = more vulnerable) |
|---|---|
| Under 5 years | 0.5 |
| Under 16 years | 0 |
| Over 65 years | 0.1 |
| Over 75 years | 0.4 |
| Over 85 years | 0.6 |
| Fuel poverty levels (Scotland; 1=low, 4=v.high) | 0 |
| Fuel poor households (England) | 0 |
| Dwellings without a mains gas connection | 0 |
| Dwellings without central heating system | 0 |
| Dwellings rated in EPC bands EFG | 0 |
| Households with no car | 0 |
| Combined distances to services (Score; high=most remote) | 0 |
| Children in low income households | 1 |
| People with low qualifications | 0 |
| People in low income employment | 1 |
| Long-term unemployment | 1 |
| Disability benefits | 1 |
| Child disability benefits | 1 |
| Mental health benefits | 1 |
| Universal credit claimants | 0 |
| People in bad or very bad health | 0.5 |
| People whose health condition limits activities a lot | 0.5 |
| Access to health services (Score; 0=best access, 100=worst access) | 0 |
| People providing over 20hrs/week of care | 0.5 |
| Number of residential care homes | 0 |
| Number of care home beds | 0 |
| Households in privated rented dwellings | 1 |
| Lone parents | 1 |
| Ethnic minorities | 1 |
| Unable to speak English well or at all | 0 |
| Lone pensioners | 1 |

## 12 Appendix 2: Relevant Policy, Standards, and Operational Restrictions

TG-NET-NPL-012.pdf

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## 13 Appendix 3. Assumptions for Flexible Solutions Costing

| Contract Year | Availability Price – CMZ Secure (£/MW/Day) | Capacity offered (MW) | Potential Days Required | Maximum Total Availability price paid | Utilisation Price – CMZ Secure (£/MWh) | Maximum Potential Energy Required (MWh)for 30 days per annum | Total Utilisation Cost (£) per annum | Yearly total |
|---|---|---|---|---|---|---|---|---|
| Year 1 | [redacted] | 0.5 | 365 | | [redacted] | 360 | | |
| Year 2 | [redacted] | 0.5 | 365 | | [redacted] | 360 | | |
| Year 3 | [redacted] | 0.5 | 365 | [redacted] | [redacted] | 360 | [redacted] | [redacted] |
| Year 4 | [redacted] | 0.5 | 365 | [redacted] | [redacted] | 360 | [redacted] | [redacted] |
| Year 4 | [redacted] | 0.5 | 365 | [redacted] | [redacted] | 360 | [redacted] | [redacted] |
| | | | | | | | | [redacted] |